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EXAMINER	
WASSUM, LUKE S	

ART UNIT	PAPER NUMBER
2167	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/800,109	MERCIER ET AL.	
	Examiner	Art Unit	
	Luke S. Wassum	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 July 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20090713*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 13 July 2009 has been entered.

Response to Amendment

2. The Applicants' amendment, filed 13 July 2009, has been received, entered into the record, and considered.

3. As a result of the amendment, claims 23-33, 35, 37 and 39-54 have been amended. Claims 1-22 have been previously canceled. Claims 23-54 remain pending in the application.

Priority

4. The examiner acknowledges the Applicants' claim to domestic priority under 35 U.S.C. § 120, as a continuation of application 09/375,819, filed 16 August 1999.

Information Disclosure Statement

5. The Applicants' Information Disclosure Statement, filed 13 July 2009, has been received and entered into the record. Since the Information Disclosure Statement complies with the provisions of MPEP § 609, the references cited therein have been considered by the examiner. See attached form PTO-1449.

Claim Objections

6. In view of the Applicants' amendment to the claims, the pending claim objections have been withdrawn.

7. Claim 26 is objected to because of the following informalities:

The claim includes a typographical error "...wherein a server configured to execute the first process and the second process."

Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. In view of the Applicants' amendment to the claims, the pending claim rejections under 35 U.S.C. § 112 have been withdrawn.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by **Ofek et al.** (U.S. Patent Application Publication 2005/0204108).

11. Regarding claim 23, **Ofek et al.** teaches a storage system as claimed, comprising:

a) a destination storage device configured to store a copy of data from a source storage device (see disclosure of a target destination, such as a receiving primary storage element or receiving secondary storage element such as a tape, paragraph [0248]);

b) a first process configured to initiate a copy operation of the source storage device, wherein the copy operation is configured to copy each block of the source storage device to the destination storage device, wherein the copy operation is performed in segments, and wherein each segment is a range of data bytes of the source storage device (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

c) the storage system configured to receive a write request to modify a requested range of data bytes of the source storage device while the copy operation of the source storage device is in progress, wherein the write request to modify the requested range of data bytes is a write request range (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]);

d) the storage system further configured to determine if the write request range falls within the range of data bytes of the source storage device being

copied while the copy operation is in progress (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

e) in response to determining that the write request range falls within the range of data bytes of the source storage device being copied while the copy operation is in progress, the storage system is further configured to determine if a particular range of the range of data bytes of the source storage device to be modified by the write request range has already been written to a snapshot (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]);

f) in response to determining that the particular range of the range of data bytes of the source storage device to be modified by the write request range has already been written to the snapshot, the write request is configured to be written to the source storage device (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

g) in response to determining that the particular range of the range of data bytes of the source storage device to be modified by the write request range has

not already been written to the snapshot, a second process is configured to copy the particular range of the range of data bytes of the source storage device to the snapshot, the second process is further configured to write the write request to the source storage device (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]).

12. Regarding claim 31, **Ofek et al.** teaches a method as claimed, comprising:

a) starting a copy command from a source storage device to a destination storage device wherein the copy command copies each block of the source storage device to the destination storage device, the copy command being performed in segments and each segment specifying a range of data bytes of the source storage device (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) receiving a write request to modify a requested range of data bytes of the source storage device while the copy command is in progress, wherein the write request to modify the requested range of data bytes is a write request range (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]);

c) determining if the write request range falls within the range of data bytes being of the source storage device being copied (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

d) determining, in response to the write request range falling within the range of data bytes of the source storage device being copied, if a particular range of the range of data bytes of the source storage device to be modified by the write request range has already been written to a snapshot (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]);

e) writing, in response to the particular range of the range of data bytes of the source storage device to be modified by the write request range having already been written to the snapshot, the write request to the source storage device (see disclosure that once the requested segment has been

copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

f) copying, in response to the particular range of the range of data bytes of the source storage device to be modified by the write request range having not already been written to the snapshot, the particular range of the range of data bytes to the snapshot, and then writing the write request to the source storage device (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]).

13. Regarding claim 39, **Ofek et al.** teaches a computer-implemented method as claimed, comprising:

a) starting a copy operation by copying data from a source storage device to a destination storage device, the copy operation being performed in segments, and each segment having a range of data bytes of the source (see disclosure of the marking of physical backup segments that contain data

from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) receiving a write request to modify a requested range of data bytes of the source storage device while the copy operation is in progress, wherein the write request to modify the requested range of data bytes is a write request range (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]);

c) determining if the write request range falls within the range of data bytes of the source storage device being copied (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

d) determining, in response to the write request range being in the range of data bytes of the source storage device being copied, if a particular range of the range of data bytes of the source storage device to be modified by the write request range has been written to a snapshot (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]);

e) writing, in response to the range of data bytes of the source storage device to be modified by the write request range having been written to the snapshot, the write request to the source storage device (see disclosure that

once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

f) copying, in response to the range of data bytes of the source storage device to be modified by the write request range having not been written to the snapshot, the particular range of the range of data bytes of the source storage device to the snapshot, and then writing the write request to the source storage device (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]).

14. Regarding claim 40, **Ofek et al.** teaches a system as claimed, comprising:

a) a destination storage device to store a copy from a source storage device (see disclosure of a target destination, such as a receiving primary storage element or receiving secondary storage element such as a tape, paragraph [0248]);

b) a first process to initiate a copy operation of the source storage device wherein the copy operation includes copying each block of the source storage device

to the destination storage device, the copy operation being performed in segments, and each segment having a range of data bytes of the source storage device (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

c) the system to receive a write request to modify a requested range of data bytes of the source storage device while the copy operation is in progress, wherein the write request to modify the requested range of data bytes is a write request range (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]);

d) the system to determine if the write request range falls within the range of data bytes of the source storage device being copied (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

e) in response to determining that the write request range falls within the range of bytes of the source storage device being copied, the system to determine if a particular range of the range of data bytes of the source storage device to be modified by the write request range have been written to a snapshot

(see disclosure that the segments yet to be copied will remain marked, paragraph [0247]);

f) in response to determining that the particular range of the range of data bytes of the source storage device to be modified by the write request range have been written to the snapshot, the write request to be written to the source storage device (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

g) in response to determining that the particular range of the range of data bytes of the source storage device to be modified by the write request range have not been written to the snapshot, a second process first to copy the particular range of the range of data bytes of the source storage device to the snapshot, and then the second process to write the write request to the source storage device (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]).

15. Regarding claim 46, **Ofek et al.** teaches a method as claimed, comprising:

a) receiving a write request while a copy operation is in progress wherein the copy operation includes copying each block of the source to the destination, the copy operation being performed in segments, and each segment has a range of data bytes of the source storage device, the write request to modify a requested range of data bytes in a source, wherein the write request to modify the requested range of data bytes is a write request range (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]; see also disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) determining if the write request range being copied falls within a particular range of the range of bytes of the source storage device to be modified by the write request range (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

c) determining that the particular range of the range of bytes of the source storage device to be modified by the write request range have not been

written to a snapshot (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]);

d) in response to determining that the particular range of the range of bytes of the source storage device to be modified by the write request range have not been written to the snapshot, copying the particular range of the range of bytes of the source storage device to be modified by the write request range to the snapshot before modifying the particular range of the range of bytes of the source storage device (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]);

e) updating a snapshot map, wherein the snapshot map indicates which blocks of the range of bytes are located in the snapshot (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248], a disclosure that renders the claimed updating of a snapshot map inherent, since without an accurate snapshot map, there would be no way in which the segments stored in the snapshot [cache] could be later copied to the target destination); and

f) modifying the particular range of the range of bytes of data in the source storage device from the write request (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]).

16. Regarding claim 50, **Ofek et al.** teaches a method for making a copy of data in a database as claimed, comprising:

a) starting a copying operation of a source storage device to a destination storage device, wherein the copy operation is performed in segments and each segment is a range of data bytes of the source storage device, the copy operation started at a begin time (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) maintaining a snapshot volume that includes each block of the source storage device that has a write request directed to that block during the course of the copy operation (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the

destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

c) receiving a write request directed to a particular range of the range of data bytes to be modified by the write request range that currently is being copied to the destination storage device (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]; see also disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

d) in response to determining that the particular range of the range of bytes to be modified by the write request range have not been copied to the snapshot volume, holding the write request until the particular range of the range of bytes to be modified by the write request range are copied to the snapshot volume (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]; see also disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

e) after completion of writing the particular range of the range of bytes to be modified by the write request range to the snapshot volume, executing the write request on the source storage device to update the source storage device (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

f) copying the snapshot volume to the destination storage device, wherein the copied snapshot volume maintains a copy of a data on the destination storage device as the data existed on the source storage device at the begin time (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]; see also disclosure that the disclosed system allows backups of a logical object at a specified point in time, paragraph [0239]).

17. Regarding claim 51, **Ofek et al.** teaches a system to make a copy of data in a database as claimed, comprising:

a) a process executing on a processor of the system configured to initiate a copy operation of a source storage device to a destination storage device, wherein the copy operation is performed in segments and each segment is a range of data bytes of the source storage device, the copy operation started at a begin time (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) the system configured to maintain a snapshot volume that includes each block of the source storage device that has a write request directed to that block during the course of the copy operation (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

c) the system is further configured to receive a write request directed to the range of data bytes currently being copied to the destination storage device (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]; see also disclosure of the marking of physical backup

segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

d) in response to determining that a particular range of the range of bytes to be modified by the write request range has not been copied to the snapshot volume, the system is further configured to hold the write request until the particular range of the range of bytes to be modified by the write request range are copied to the snapshot volume (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]; see also disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

e) after completion of writing the particular range of the range of bytes to the snapshot volume, the system is further configured to execute the write request on the source storage device to update the source (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

f) the system is further configured to copy the snapshot volume to the destination storage device, wherein the copied snapshot volume is

configured to maintain a copy of a data on the destination storage device as the data existed on the source storage device at the begin time (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]; see also disclosure that the disclosed system allows backups of a logical object at a specified point in time, paragraph [0239]).

18. Regarding claim 52, **Ofek et al.** teaches a computer-readable storage media containing executable program instructions executed by a processor as claimed, comprising:

a) program instructions that start a copying operation of a source storage device to a destination storage device, wherein the copy operation is performed in segments and each segment is a range of data bytes of the source storage device, the copy operation started at a begin time (see disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

b) program instructions that maintain a snapshot volume that includes each block of the source storage device that has a write request directed to that block during the course of the copy operation (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

c) program instructions that receive a write request directed to a particular range of the range of data bytes to be modified by the write request range that currently is being copied to the destination storage device (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]; see also disclosure of the marking of physical backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19);

d) in response to determining that the particular range of the range of bytes to be modified by the write request range have not been copied to the snapshot volume, program instructions that hold the write request until the particular range of the range of bytes to be modified by the write request range are copied to the snapshot volume (see disclosure that the segments

yet to be copied will remain marked, paragraph [0247]; see also disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]);

e) program instructions that, after completion of writing the particular range of the range of bytes to be modified by the write request range to the snapshot volume, execute the write request on the source storage device to update the source storage device (see disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]); and

f) program instructions that copy the snapshot volume to the destination storage device, wherein the copied snapshot volume maintains a copy of a data on the destination storage device as the data existed on the source storage device at the begin time (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]; see also

disclosure that the disclosed system allows backups of a logical object at a specified point in time, paragraph [0239]).

19. Regarding claim 26, **Ofek et al.** additionally teaches a storage system wherein a server configured to execute the first process (see a general discussion and illustration of the network architecture, drawing Figures 8 and 9, as well as paragraphs [0125] through [0143]).

20. Regarding claim 28, **Ofek et al.** additionally teaches a storage system wherein the process is configured to control multiple storage systems (see drawing Figures 11A and 11B et seq.).

21. Regarding claims 29 and 37, **Ofek et al.** additionally teaches a storage system and method wherein the write request includes SCSI commands (see drawing Figure 29; see also paragraph [0134] et seq.).

22. Regarding claims 34 and 36, **Ofek et al.** additionally teaches a method including executing a copy process and managing multiple storage device controllers (see drawing Figures 11A and 11B et seq.).

The examiner notes that the limitation that these steps are carried out by a replication controller is not patentably limiting, since (1) it only serves to give a label to the process executing the method, and (2) the claim is to a method, which constitutes a number of steps; there is no patentable distinction to be made based upon who (or what process) carries out the execution of the claimed steps.

23. Regarding claim 41, **Ofek et al.** additionally teaches a system wherein the first and second processes are executed on a file server (see a general discussion and illustration of the network architecture, drawing Figures 8 and 9, as well as paragraphs [0125] through [0143]) and wherein the processes are configured to control multiple storage systems (see drawing Figures 11A and 11B et seq.).

24. Regarding claim 45, **Ofek et al.** additionally teaches a system wherein the first and second processes are configured to specify a block size so that the storage system

writes one or more fixed-size blocks (see disclosure of the ability to specify the physical backup granularity, paragraphs [0236] and [0237] et seq.).

25. Regarding claim 54, **Ofek et al.** additionally teaches a method further comprising:

a) in response to determining that the write request range does not fall within the particular range of the range of data bytes of the source storage device being copied, determining if the write request range is directed to a next particular range of the range of data bytes that has not yet been written to the snapshot (see disclosure that the segments yet to be copied will remain marked, paragraph [0247]); and

b) in response to determining that the write request range is directed to the next particular range of the range of data bytes that has not yet been written to the snapshot, copying the next particular range of the range of bytes not yet written to the snapshot (see disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot] for later copying to the destination, paragraphs [0247] and [0248]).

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

27. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

28. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not

commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

29. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) in view of **Smith et al.** (U.S. Patent 5,241,631).

30. Regarding claim 49, **Ofek et al.** teaches a computer-readable storage media containing executable program instructions executed by a processor substantially as claimed, comprising:

a) program instructions that receive at a source storage device a write request issued from a storage system, the write request specifying a first range of data bytes of the source storage device, the write request being received while the source storage device is being copied to a destination storage device (see disclosure of the receipt of a request to write [hit] to the source device, paragraph [0247]; see also disclosure of the marking of physical

backup segments that contain data from the logical object marked for copying, paragraph [0243]; see also drawing Figure 19); and

b) program instructions that, in response to receiving the write request, check if the first range overlaps with a second range, wherein the second range is a particular range of the range of data bytes of the source storage device to be modified by the write request that is being copied to the destination storage device and, in response to the first range overlapping with the second range of data bytes of the source storage device to be modified by the write request, program instructions that copy the second range from the source storage device to a snapshot, program instructions that update a snapshot map, and program instructions that then allow the write request to write to the source storage device (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, that the segments yet to be copied will remain marked, the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]; see also disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed

snapshot] for later copying to the destination, paragraphs [0247] and [0248], a disclosure that renders the claimed updating of a snapshot map inherent, since without an accurate snapshot map, there would be no way in which the segments stored in the snapshot [cache] could be later copied to the target destination; see also disclosure that once the requested segment has been copied, the segment is unmarked and the requested update is made, paragraphs [0247] and [0251]).

Ofek et al. does not explicitly teach a computer-readable storage media wherein the write request is held in a cache while steps are taken to ensure consistency of the snapshot.

Smith et al., however, teaches the use of a write buffer cache architecture, which allows write requests to be held in a FIFO buffer cache while awaiting execution (see col. 17, lines 11-26 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a FIFO buffer cache to hold write request commands until they could be executed, since this allows the microprocessor to continue other operations without

the need to wait until the write commands have all been executed (see col. 17, lines 11-26).

31. Claims 24 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 above.

32. Regarding claims 24 and 32, **Ofek et al.** teaches a storage system and method substantially as claimed.

Ofek et al. does not explicitly teach a storage system and method wherein the source storage device is a RAID system.

However, **Ofek et al.** does disclose the use of RAID systems in the prior art (see drawing Figures 3A and 3B, as well as paragraphs [0029] through [0035]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize a RAID system, since this would provide redundancy to provide security against the loss of data (see paragraph [0030] et seq.)

33. Claims 25, 33, 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 above, and further in view of **Smith et al.** (U.S. Patent 5,241,631).

34. Regarding claims 25 and 33, **Ofek et al.** teaches a storage system and method substantially as claimed, including wherein the system is further configured, in response to determining the write request falls within the range of bytes being copied, delaying the write request and updating the snapshot map (see disclosure of the determination that the request was for a physical backup segment that is included in the backup segment set in the abstract block set, paragraph [0247]; see also disclosure that before a requested write can take place, the requested segment is copied out of turn, either directly to the destination, or to a cache [analogous to the claimed snapshot]

for later copying to the destination, paragraphs [0247] and [0248], a disclosure that renders the claimed updating of a snapshot map inherent, since without an accurate snapshot map, there would be no way in which the segments stored in the snapshot [cache] could be later copied to the target destination).

Ofek et al. does not explicitly teach a storage system and method wherein the write request is held in a cache while steps are taken to ensure consistency of the snapshot.

Smith et al., however, teaches the use of a write buffer cache architecture, which allows write requests to be held in a FIFO buffer cache while awaiting execution (see col. 17, lines 11-26 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a FIFO buffer cache to hold write request commands until they could be executed, since this allows the microprocessor to continue other operations without the need to wait until the write commands have all been executed (see col. 17, lines 11-26).

35. Regarding claims 47 and 48, **Ofek et al.** teaches a system substantially as claimed.

Ofek et al. does not explicitly teach a system further comprises a first in first out queue configured to buffer the write request in response to determining that the particular range of the range of data bytes of the source storage device to be modified by the write request range have not been written to the snapshot.

Smith et al., however, teaches the use of a write buffer cache architecture, which allows write requests to be held in a FIFO buffer cache while awaiting execution (see col. 17, lines 11-26 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a FIFO buffer cache to hold write request commands until they could be executed, since this allows the microprocessor to continue other operations without the need to wait until the write commands have all been executed (see col. 17, lines 11-26).

36. Claims 27 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 above, and further in view of **Tawil** (U.S. Patent 6,421,723).

37. Regarding claims 27 and 35, **Ofek et al.** teaches a storage system and method substantially as claimed.

Ofek et al. does not explicitly teach a storage system and method wherein the server is operatively connected to a storage area network switch and the server is further configured to communicate with the storage device controller through the storage area network switch.

Tawil, however, teaches the use of a storage area network (see col. 1, lines 30-42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a storage area network, since they offer centralized storage of data for increased efficiency and data handling, and provide data access reliability and

availability, unobtrusive capacity expansion, improved data backup and recovery, and performance that is competitive with local data storage (see col. 1, lines 30-36).

38. Claims 30 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 above, and further in view of **Dulai et al.** (U.S. Patent 6,205,479).

39. Regarding claims 30 and 38, **Ofek et al.** teaches a storage system and method substantially as claimed.

Ofek et al. does not explicitly teach a storage system and method wherein the controller is further configured to send the one or more storage device commands by using one of an in-band protocol or an out-of-band protocol.

Dulai et al., however, teaches a storage system and method wherein the controller is operable to send the one or more storage device commands by using one of

an in-band protocol or an out-of-band protocol (see disclosure of the use of an in-band protocol, claims 18 and 21).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize an in-band protocol, since this allows the transmission of commands over a widely dispersed network where the use of an out-of-band protocol might be impractical.

40. Claims 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31, 34, 36, 37, 39-41, 45, 46, 50-52 and 54 above, and further in view of **Simpson et al.** (U.S. Patent 6,128,306).

41. Regarding claims 42-44, **Ofek et al.** teaches a storage system and method substantially as claimed.

Ofek et al. does not explicitly teach a storage system and method wherein a list comprising source storage device data blocks to be copied is configured to be reordered, wherein control data is inserted before and after the source storage device data block, nor wherein the list is buffered.

Simpson et al., however, teaches a storage system and method comprising a list of blocks to be copied which is reordered to optimize copy speed (see col. 2, lines 15-18), wherein control data is inserted before and after the source data block (see col. 2, lines 5-9), and wherein the list is buffered (see col. 1, lines 55-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include prioritized buffering of output data, since this allows more flexible handling of outgoing data traffic, and furthermore since input/output buffering and prioritization and reordering of data in queues was well known in the art at the time of the invention.

42. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ofek et al.** (U.S. Patent Application Publication 2005/0204108) as applied to claims 23, 26, 28, 29, 31,

34, 36, 37, 39-41, 45, 46, 50-52 and 54 above, and further in view of **Osterman** (U.S. Patent 5,867,650).

43. Regarding claim 53, **Ofek et al.** teaches a storage system substantially as claimed.

Ofek et al. does not explicitly teach a storage system wherein the storage system is configured to send one or more commands by using an out-of-band protocol.

Osterman, however, teaches a storage system wherein the storage system is operable to send one or more commands by using an out-of-band protocol (see col. 2, lines 6-19 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize out-of-band protocol, since it allows more rapid transmission of large amounts of data (see col. 7, lines 38-45 et seq.).

Response to Arguments

44. Applicant's arguments filed 13 July 2009 have been fully considered but they are not persuasive.

45. Regarding the Applicants' argument that there is a distinction between the **Okef** reference's performing an out-of-turn copy and the claimed system/method, the examiner respectfully disagrees.

In both instances, a copy operation is underway. The examiner directs the Applicants' attention to the process flow diagram in drawing Figure 19 of the **Ofek et al.** reference.

The copy operation commences at step 191, first checks to see if there was a write requested on the data range being copied, if so performs the out-of-turn copy operation, if not copies the next available segment, and iterates the process. Only when all segments which have been marked for copying have been copied does the copy operation complete (step 197).

46. Regarding the Applicants' argument that the **Ofek et al.** reference does not disclose determining, in response to the write request range falling within the range of

data bytes being copied while the copy operation is in progress, if a particular range of the range of data bytes of the source storage device to be modified by the write request range has already been written to a snapshot and in response to determining that the particular range of the range of data bytes to be modified by the write request range has not already been written to the snapshot, copying the particular range of the range of data bytes of the source storage device to the snapshot, the examiner respectfully disagrees.

The examiner has reviewed the relevant portions of the **Ofek et al.** reference, as well as the Applicants' own specification and drawings, and has failed to find any disclosure which supports an interpretation of the claims in such a way that they distinguish over to the cited prior art. In both cases, there is an ongoing copy operation, write operations are intercepted, a check is made to determine whether the write is directed to blocks which are being copied, and if so, and if the relevant bytes have not yet been copied, they are first copied and then the write operation is allowed to proceed. These operations are detailed, for instance, in drawing Figure 19 and the accompanying portions of the specification of the **Ofek et al.** reference, as well as in the pseudcode supplied in the Applicants' specification at page 6, line 27 through page 7, line 10, as well as drawing Figure 5.

47. Regarding the Applicants' argument that the **Ofek et al.** reference teaches a system wherein data in excess of what is actually being modified is copied even when it has been previously backed up, the examiner respectfully disagrees.

Although paragraph [0252] does disclose such a situation, as pointed out by the Applicants in their remarks, the reference also clearly discusses the fact that different physical backup segment granularity can also be implemented in paragraphs [0252] through [0255].

48. In summary, the examiner has reviewed the Applicants' specification and drawings in order to apply correct interpretation to the currently presented claims. The examiner has not been able to find any patentable distinction between the Applicants' invention as disclosed and claimed, and that of the prior art of record.

In the event that the Applicants disagree, they are encouraged to point out which portions of the Applicants' specification particularly spell out distinguishing features of the Applicants' disclosed invention over the prior art of record.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luke S. Wassum whose telephone number is 571-272-4119. The examiner can normally be reached on Monday-Friday 8:30-5:30, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Cottingham can be reached on 571-272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

In addition, INFORMAL or DRAFT communications may be faxed directly to the examiner at 571-273-4119, or sent via email at luke.wassum@uspto.gov, **with a previous written authorization in accordance with the provisions of MPEP § 502.03.** Such communications must be clearly marked as INFORMAL, DRAFT or UNOFFICIAL.

Customer Service for Tech Center 2100 can be reached during regular business hours at (571) 272-2100, or fax (571) 273-2100.

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/Luke S. Wassum/
Primary Examiner
Art Unit 2167

lsw
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